(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 381 000**
A1

EUROPEAN PATENT APPLICATION

(12)

(21) Application number: 90101213.8

(22) Date of filing: 22.01.90

(51) Int. Cl.5: E04C 2/04, E04C 2/20, E04C 2/38

(30) Priority: 30.01.89 IT 1924389

(43) Date of publication of application:
08.08.90 Bulletin 90/32

(84) Designated Contracting States:
CH DE ES FR IT LI

(71) Applicant: Zambelli, Sergio
Via Roma 44
I-24050 Zanica (Bergamo)(IT)

Applicant: Zambelli, Benito
Via Roma 44
I-24050 Zanica (Bergamo)(IT)

(72) Inventor: Zambelli, Sergio
Via Roma 44
I-24050 Zanica (Bergamo)(IT)
Inventor: Zambelli, Benito
Via Roma 44
I-24050 Zanica (Bergamo)(IT)

(74) Representative: Modiano, Guido et al
MODIANO, JOSIF, PISANTY & STAUB
Modiano & Associati Via Meravigli, 16
I-20123 Milano(IT)

(54) Prefabricated concrete panel with thermally insulating or lightening layer.

(57) The panel comprises a reinforcement frame (2) substantially constituted by at least two longitudinal profiled elements (3a, 3b) and two transverse ones (4a, 4b) which perimetrically delimit the panel. The profiled elements are fixed in two concrete layers (7, 8) which constitute the two larger faces of the panel and are mutually spaced so as to define an interspace which accomodates the thermally insulating or lightening material layer (9).

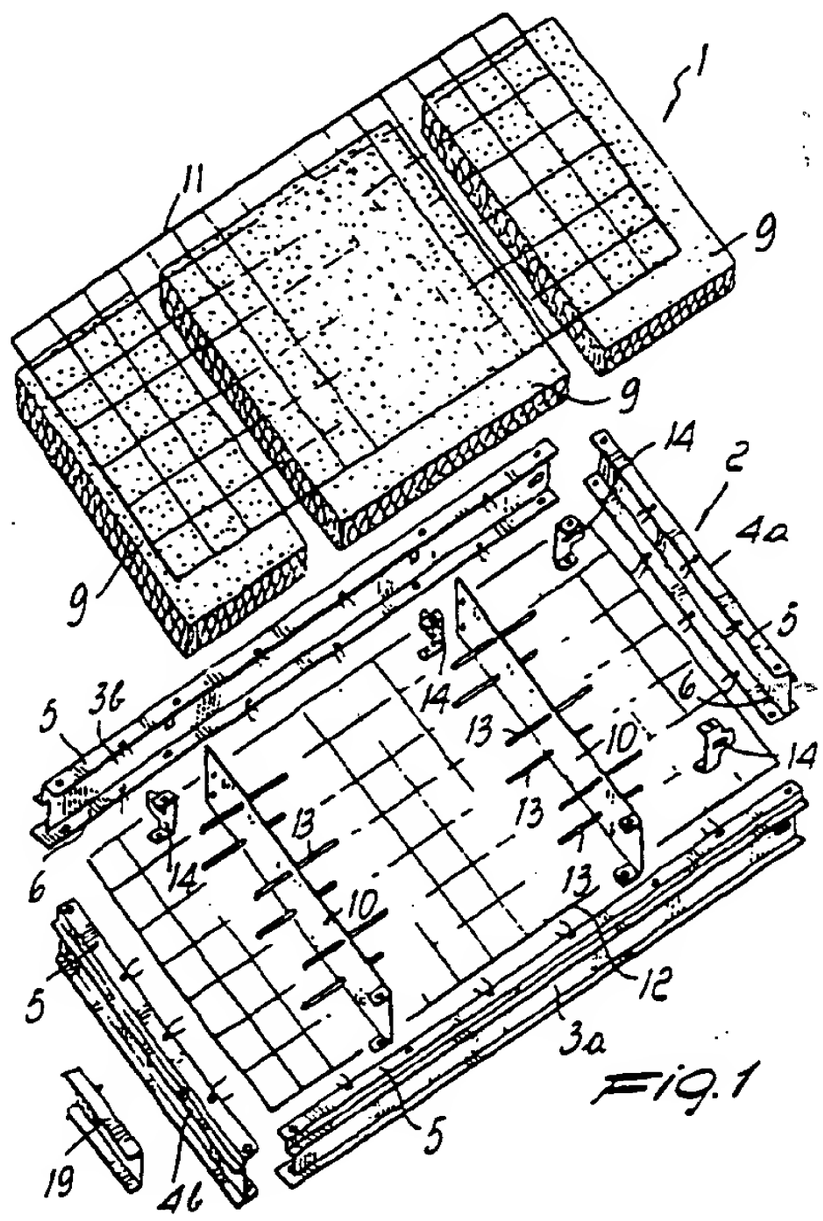

Fig.1

EP 0 381 000 A1

PREFABRICATED CONCRETE PANEL WITH THERMALLY INSULATING OR LIGHTENING LAYER

The present invention relates to a prefabricated concrete panel with thermally insulating or lightening layer.

Prefabricated concrete panels inside which there is a layer of thermally insulating or lightening material are known. Such panels are generally constituted by two layers of concrete which constitute the two larger faces of the panel, and concrete cross-members are arranged between them and mutually connect the two larger faces; said cross-members are alternated with cavities in which layers of low-density material are generally placed to act as thermal insulators or lightening elements. The load-bearing function of the panel, if required, is performed by reinforcement rods embedded in the concrete cross-members which connect the panel larger faces.

Such known kinds of panel have some disadvantages.

In particular, the concrete cross-members which join the two opposite faces of the panel provide thermal bridges between the two faces, considerably reducing the effectiveness of the thermally insulating layer. Due to their structure with alternated solid portions and empty portions, these known kinds of panel can furthermore be affected by possibly considerable stresses due to the different thermal expansion of the parts which compose them.

In many cases, in order to provide thermal insulation on the outer side of civil or industrial buildings, a layer of thermally insulating material is applied to the outer walls and is covered by means of single-layer concrete panels which are fixed to the walls thus covered.

In this case, though there are no problems as regards thermal insulation or expansion of the products, there is the disadvantage that finishing of the covering is required to conceal the applied layer of thermally insulating material which is laterally visible after application of the panels. Said finishing operations, with rather high costs, are necessary, as well as for aesthetic reasons, also to prevent the insulating layer from being attacked by rodents or birds and by the effects of weather.

The aim of the present invention is to solve the above described problems by providing a prefabricated concrete panel which has high performance in terms of thermal and acoustic insulation and of resistance to fire and to the effects of weather, without requiring finishing operations after installation.

Within the scope of this aim, an object of the invention is to provide a panel which is practically free from thermal bridges between the two opposite faces.

Another object of the invention is to provide a panel which has no significant stresses due to thermal expansions.

Still another object is to provide a panel which can be manufactured in a simple manner with conventional panel prefabrication systems with modest production costs.

This aim, these objects and others which will become apparent hereinafter are achieved by a prefabricated concrete panel with thermally insulating or lightening layer, as defined in claim 1.

The characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of the prefabricated panel according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is an exploded perspective view of a panel according to the invention with the concrete parts omitted;

figure 2 is a schematic transverse sectional view of the panel according to the invention;

figure 3 is a sectional view, taken along a horizontal plane, showing the coupling of two vertically arranged panels according to the invention; and

figure 4 is a sectional view, similar to figure 3, illustrating the coupling between two panels provided according to a different embodiment of the invention;

figure 5 is an exploded perspective view of a different embodiment of the reinforced frame.

With reference to figures 1 to 3, the panel according to the invention, generally indicated by the reference numeral 1, comprises a reinforcement frame 2 which is substantially constituted by two longitudinal profiled elements 3a and 3b and by two transverse profiled elements 4a and 4b which substantially perimetrically delimit the panel. The reinforcement frame 2 can be made of various materials, such as steel, thermosetting plastic materials, materials additivated with resins and/or polymers, etc. Said reinforcement frame can be made monolithically in a single pre-cast part or can be constituted, as illustrated, by a plurality of parts which are coupled by means of bolts, by fixing means, by gluing, by tying, by welding etc.

The profiled elements 3a, 3b, 4a and 4b are provided, on the mutually facing sides of the reinforcement frame, with two wings 5 and 6 which are embedded in two concrete layers 7 and 8 which constitute the larger faces of the panel. The two layers 7 and 8 are mutually spaced so as to define an interspace which is filled with a layer 9 of

granular or compact, thermally insulating and/or lightening material which has surface dimensions substantially equal to those of the panel. The layer 9 can be constituted, for example, by polystyrene of any density, cork, foamed clay, polyurethane, rock wool, materials made of mineral and/or polymer fibers, etc.

The two concrete layers 7 and 8 can be produced by simply using concrete or concrete additivated with resins, mineral or polymer fibers according to the requirements.

Conveniently, in the case of medium- and large-length panels, additional stiffening transverse profiled elements 10 are provided which are arranged substantially parallel to the transverse profiled elements 4a and 4b and are fixed in the two concrete layers 7 and 8. The profiled elements 10 are fixed to the longitudinal profiled elements 3a and 3b similarly to the profiled elements 4a and 4b.

Reinforcement grids 11 and 12 are embedded in the two concrete layers 7 and 8 and can be fixed to the wings 5 and 6 and possibly to longitudinal rods 13 supported by the additional transverse profiled elements 10.

Grip elements 14 are appropriately provided along the longitudinal profiled elements 3a and 3b, protrude transversely and longitudinally from the panel and are useful to move it. Said grip elements are also rigidly associated with the transverse profiled elements 4a and 4b or with the transverse profiled elements 10 as well as to the longitudinal profiled elements 3a and 3b.

In its basic embodiment, the panel can be obtained by means of a forming box 15 simply constituted by a base plate 16 and by two appropriately shaped lateral shoulders 17 and 18, as illustrated in figure 2.

The panels thus obtained constitute load-bearing or self-supporting construction elements, depending on the reinforcement frame 2 used, which are placed mutually adjacent by means of coupling profiled elements 19 fixed to the profiled elements 3a, 3b, 4a, 4b which constitute the reinforcement frame.

According to the different embodiment illustrated in figure 4, the longitudinal or transverse profiled elements which constitute the reinforcement frame, indicated by the reference numerals 20 and 21, can affect substantially all the thickness of the panel, acting as concrete containment element and making unnecessary the use of the forming-box shoulders to form them.

In this case, furthermore, the profiled elements arranged on two opposite sides of the panel externally have mutually associable configurations, in particular counter-shaped configurations, for example of the male-female type, thus also avoiding the use of coupling profiled elements 19.

The same reference numerals used in figures 1 to 3 have been kept in figure 4 for the other elements which constitute the panel and are identical to those of the above described basic embodiment.

According to the different embodiment illustrated in figure 5, the reinforcement frame, indicated by the reference numeral 31, comprises perimetral profiled elements 32 and additional profiled elements 34 which have the same profile and are simply obtained by bending. In this case, each profiled element 32, 34 has a substantially I-shaped configuration in transverse cross section. Holes 33 are defined on the two parallel wings 32a and 32b, 34a and 34b of said profiled element 32, 34 and are elongated in a direction which is parallel to the longitudinal extension of said profiled elements; said holes are used to mutually associate, by bolting, the profiled elements which constitute the reinforcement frame.

Said holes 33 are conveniently arranged, on each of said wings 32a, 32b, 34a, 34b, along two parallel rows, and the holes which belong to said two rows are mutually offset parallel to the longitudinal extension of the respective profiled element to facilitate positioning and assembly of the profiled elements and to obtain greater precision in angle couplings.

The use of the profiled elements 32, by virtue of their particular configuration, provides a greater flexural strength for the panel and an excellent fixing of the profiled elements in the concrete.

Holes 35 are conveniently defined in the core 34c of the additional transverse profiled elements 34 so as to provide a connection between the regions occupied by the layers 9. This connection makes the thermal conditions inside the panel uniform, particularly with regard to the distribution of humidity inside the panel.

In practise it has been observed that the panel according to the invention fully achieves the intended aim, since by virtue of the thermally insulating or lightening layer substantially affecting the entire dimensions of the panel with no significant discontinuities, high performance in terms of thermal and acoustic insulation, resistance to fire and to the effects of weather is achieved without requiring any additional operation after installation and with no disadvantages of any sort due to different thermal expansions in the various parts which compose the panel.

The prefabricated panel thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent elements.

In practise, the materials employed, as well as the dimensions, can be any according to the re-

quirements and to the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A prefabricated concrete panel with thermally insulating or lightening layer, characterized by a reinforcement frame (2) including at least two longitudinal profiled elements (3a, 3b; 20, 21; 32) and two transverse profiled elements (4a, 4b; 20, 21; 32), which substantially perimetrically delimit said panel (1) and are fixed in two concrete layers (7, 8) defining two larger faces of said panel, said two concrete layers (7, 8) being mutually spaced so as to define an interspace which accomodates a layer (9) of thermally insulating or lightening material.

2. A prefabricated panel according to claim 1, characterized by additional stiffening transverse profiled elements (10; 34) fixed in said two concrete layers (7, 8) and rigidly associated with said longitudinal profiled elements (3a, 3b; 20, 21; 32).

3. A prefabricated panel according to claim 1, characterized in that reinforcement grids (11, 12) are embedded in said two concrete layers (7, 8).

4. A prefabricated panel according to any of the preceding claims, characterized in that grip elements (14) are provided along said two longitudinal profiled elements (3a, 3b), said grip elements protruding from said panel (1) for moving it.

5. A prefabricated panel, according to any of the preceding claims, characterized in that the profiled elements (20, 21) arranged on two opposite sides of said panel (1) externally have mutually associable configurations.

6. A prefabricated panel according to any of the preceding claims, characterized in that said reinforcement frame (2) substantially extends along the entire thickness of the panel as perimetric panel containment element.

7. A prefabricated panel according to any of the preceding claims, characterized in that said additional transverse profiled elements (10) carry longitudinal bars (13) embedded in said two concrete layers (7, 8) and associated with said reinforcement grids (11, 12).

8. A prefabricated panel, according to any of the preceding claims, characterized in that said layer (9) of thermally insulating or lightening material is compact.

9. A prefabricated panel, according to any of claims 1-7, characterized in that said layer (9) of thermally insulating or lightening material is in the granular state.

10. A prefabricated panel according to any of the preceding claims, characterized in that said profiled elements (32, 34) have substantially the same approximately I-shaped profile obtained by bending.

11. A prefabricated panel, according to claim 10, characterized in that holes (33) are defined on two parallel wings (32a, 32b, 34a, 34b) of said I-shaped profiled elements (32, 34) for mutual coupling of said profiled elements, said holes being elongated in a direction which is parallel to the longitudinal extension of the respective profiled element (32).

12. A prefabricated panel, according to claims 10 and 11, characterized in that said holes (33) are arranged on each wing (32a, 32b) of the respective profiled element (32, 34) along two mutually parallel rows, the holes which belong to one row being longitudinally offset with respect to the holes of the other row.

13. A prefabricated panel, according to any of the preceding claims, characterized in that said additional transverse profiled elements (34) have connecting holes (35) for the regions of the panel occupied by said layer (9) of thermally insulating or lightening material.

SDOCID: <EP___0381000A1_I_>

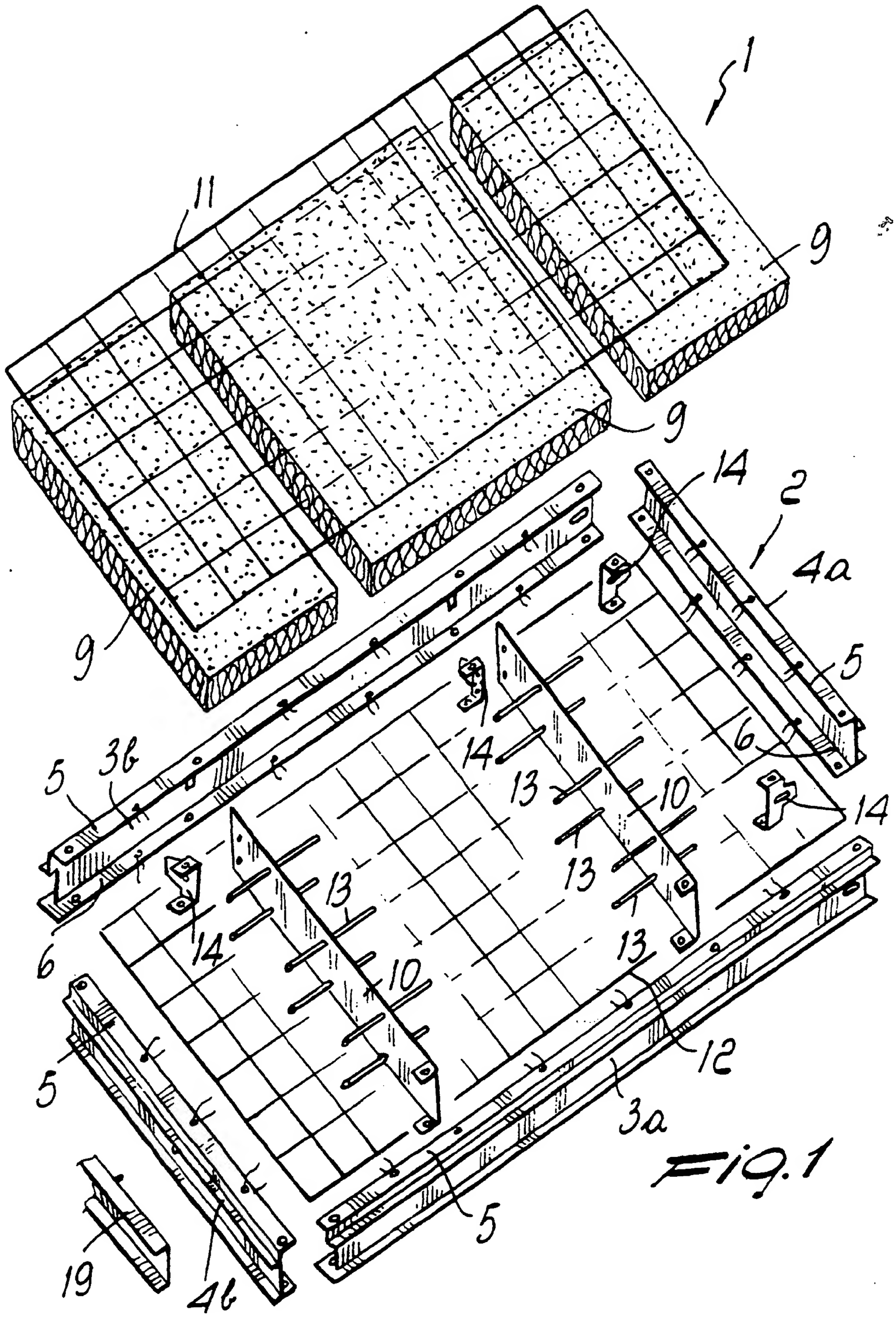

Fig. 1

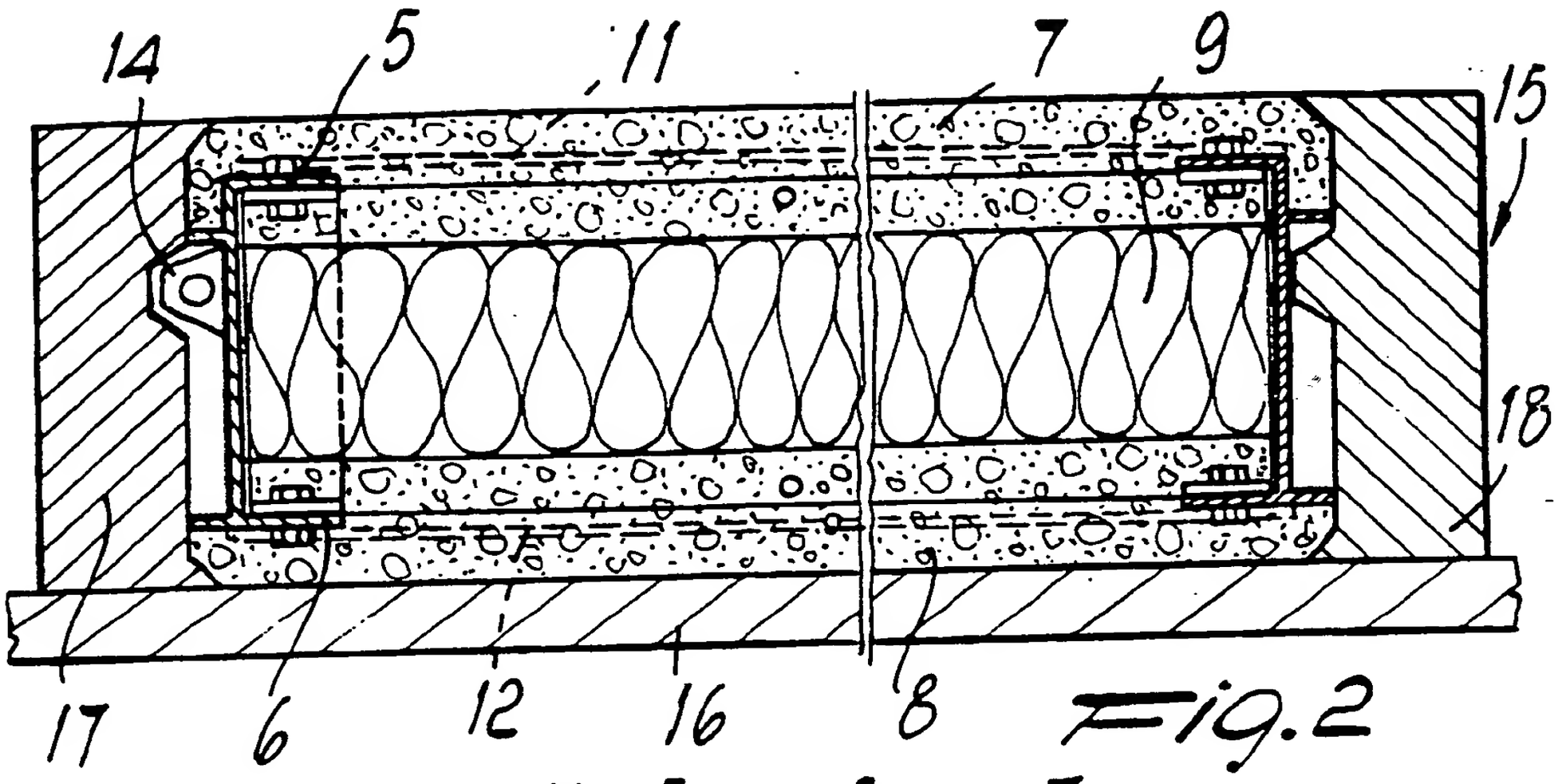

Fig.2

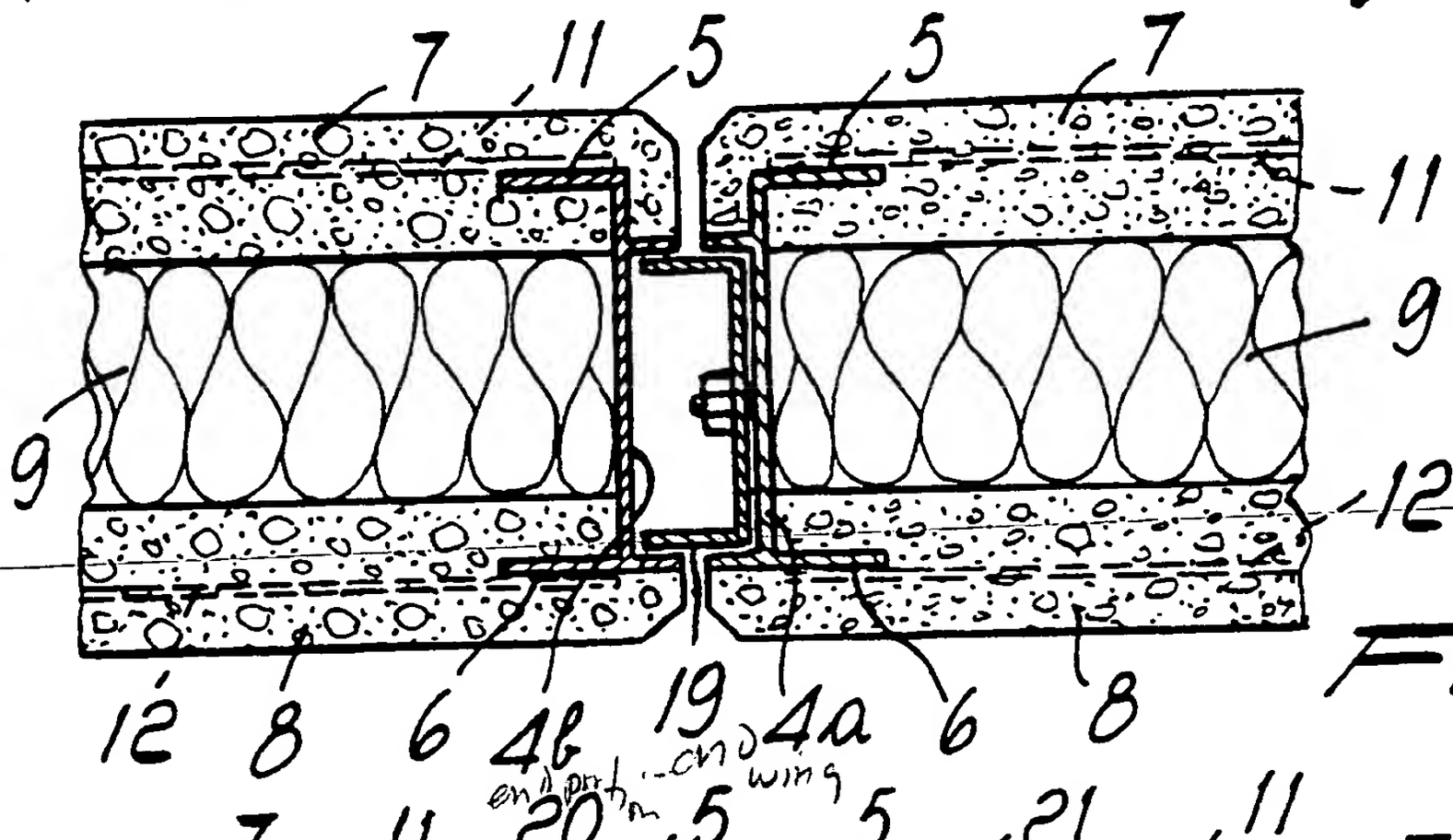

Fig.3

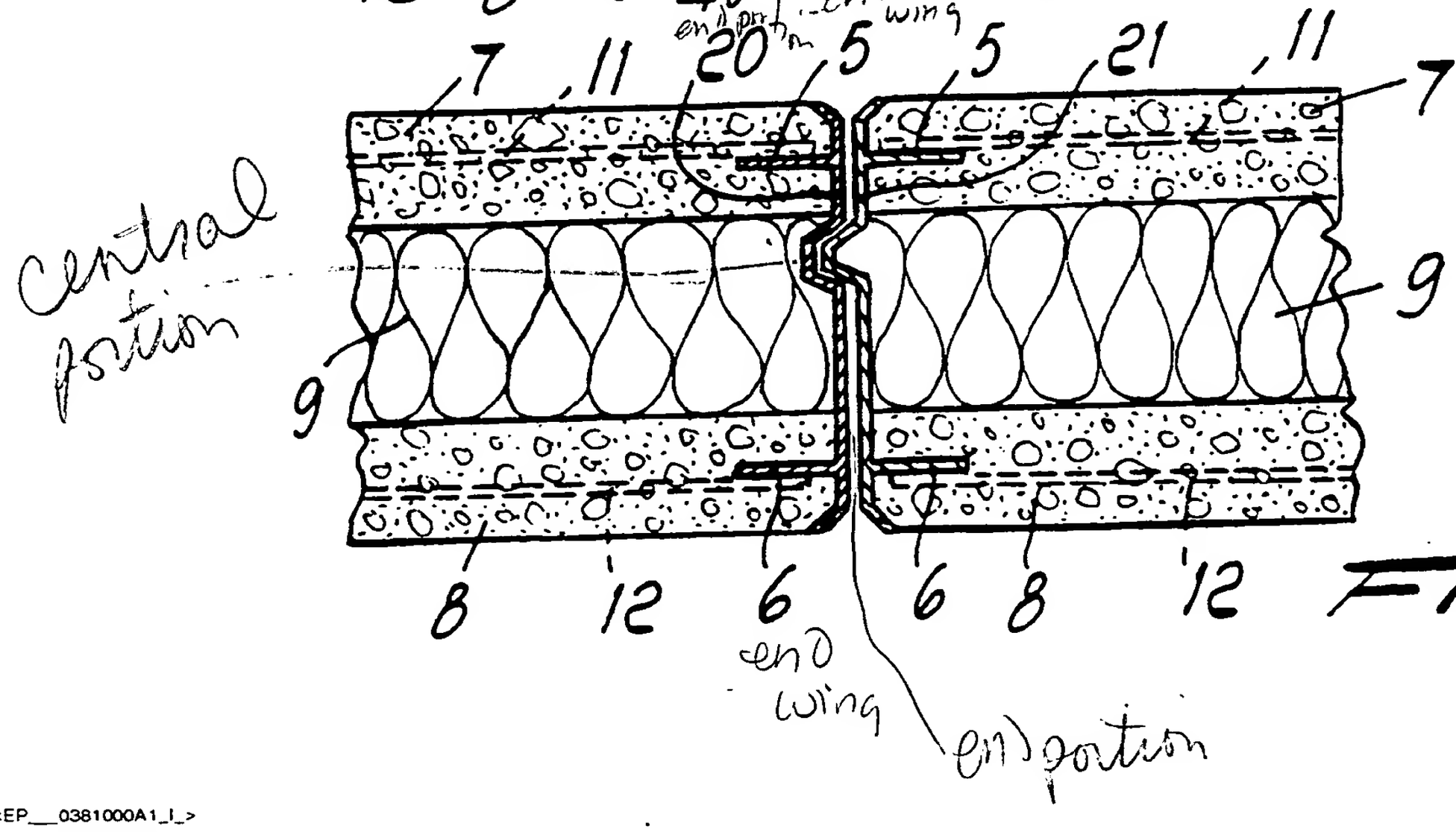

Fig.4

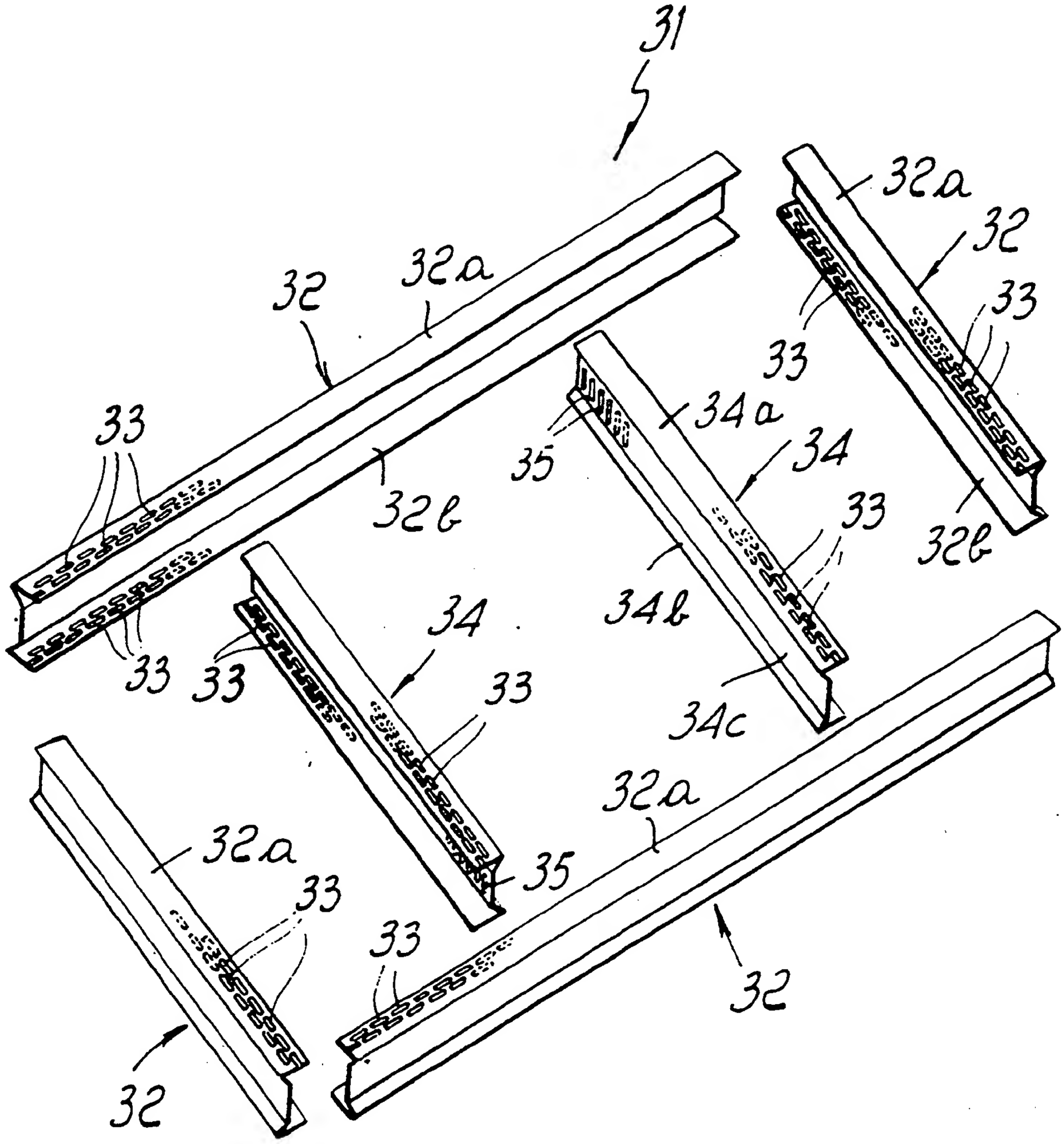

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 1213

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 649 682 (BARRET) * Column 3, line 33 - column 4, line 5; lines 34-35; figures 1-5 *	1,2	E 04 C 2/04 E 04 C 2/20 E 04 C 2/38
Y		3-10	
Y	US-A-3 760 540 (LATORIA) * Column 3, line 7 - column 4, line 15; lines 32-47; column 9, line 28 - column 10, line 3; figures 1-4,10 *	3-6,8	
A		1	
Y	US-A-4 602 467 (SCHILGER) * Column 2, line 58 - column 4, line 2; figures 1-12 *	7	
A		1-3	
Y	FR-A-2 470 213 (TECHNIQUES DE PROTECTION CONTRE L'INCENDIE, STPI, SA) * Claims 1,6; figures 1-4 *	9	
Y	CH-A- 452 852 (PLEGAT) * Column 1, line 30 - column 2, line 33; column 3, lines 7-13; figures 1,4 *	10	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A		1,2,8	E 04 C
A	US-A-4 489 530 (CHANG) * Column 2, line 56 - column 4, line 15; figures 1-6 *	1-3,8, 11,13	
A	US-A-1 813 909 (BRAINARD et al.) * Page 1, line 69 - page 2, line 5; lines 30-40; figure 5 *	1,5,6,8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19-03-1990	DE COENE P.J.S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

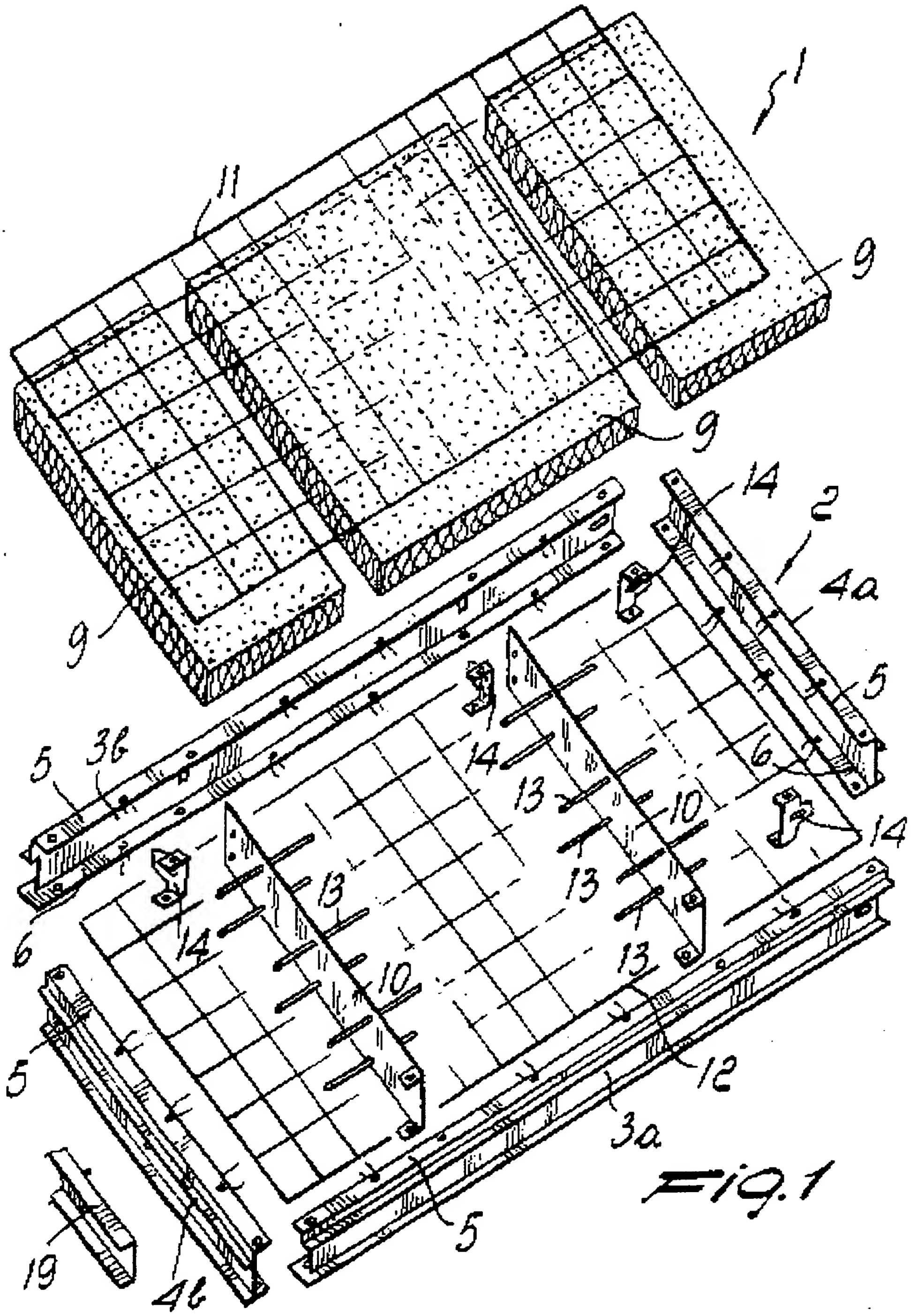

Fig. 1

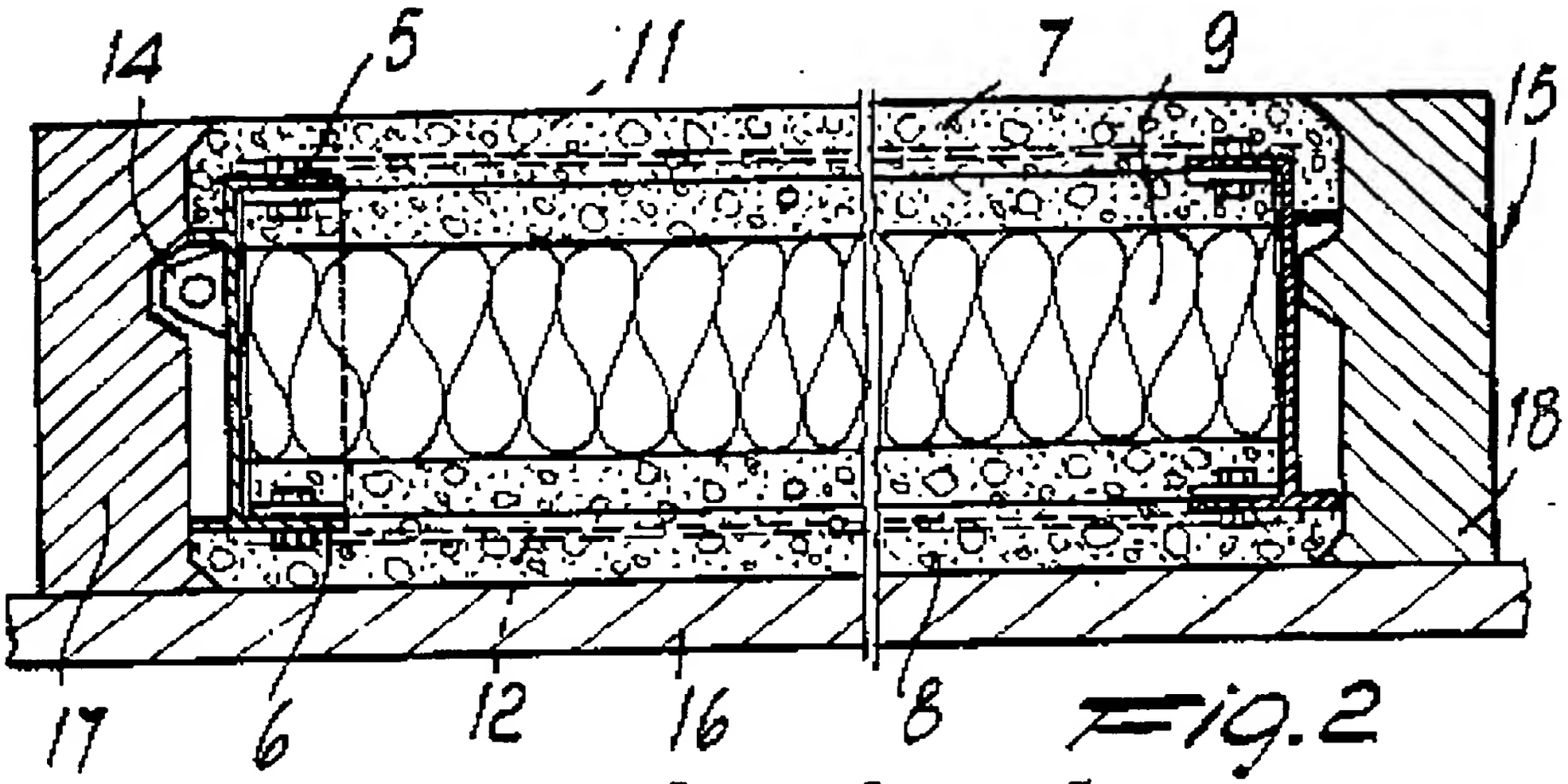

Fig.2

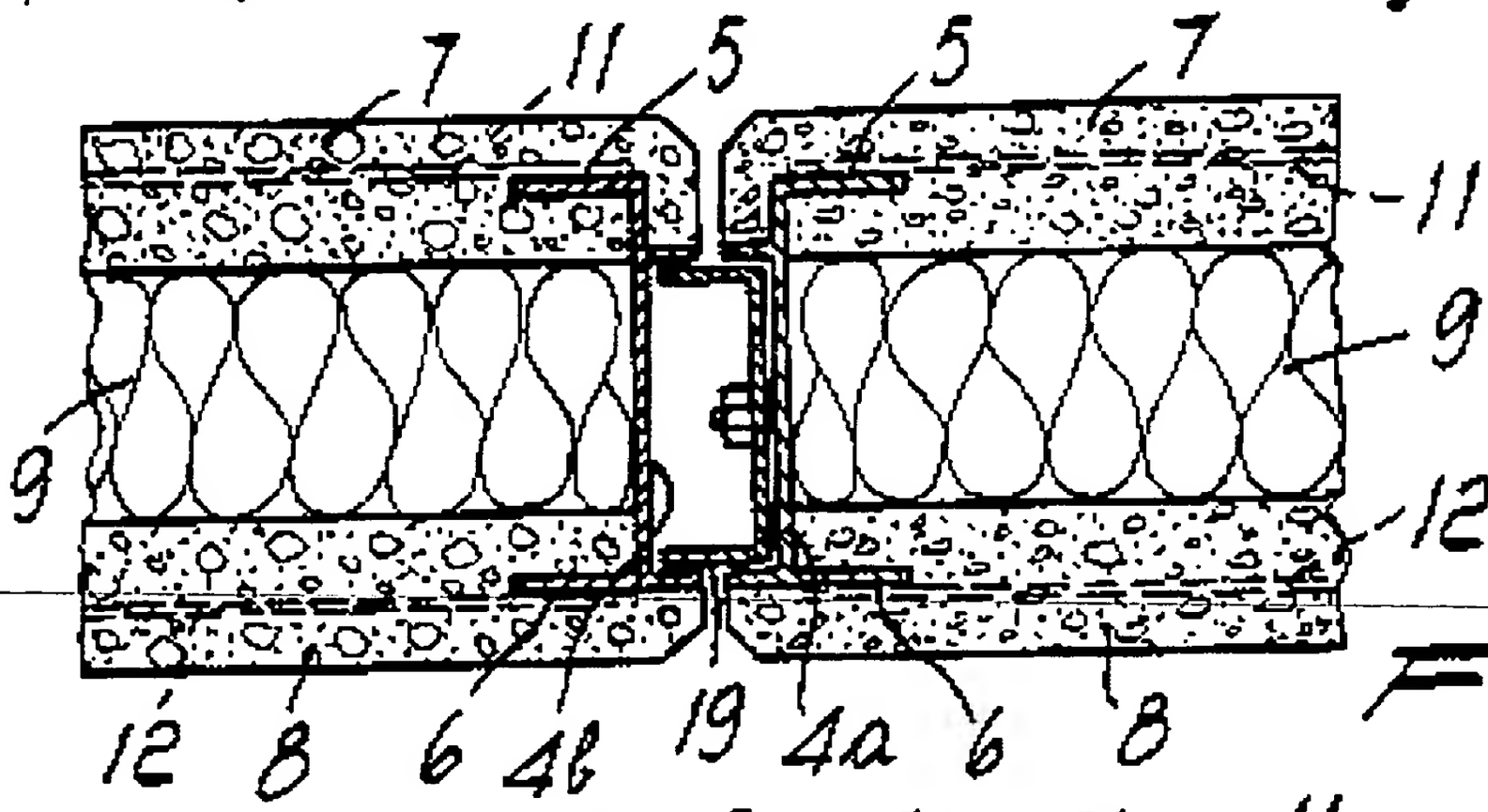

Fig.3

Fig.4

SDOCID: <EP___0381000A1TI_>

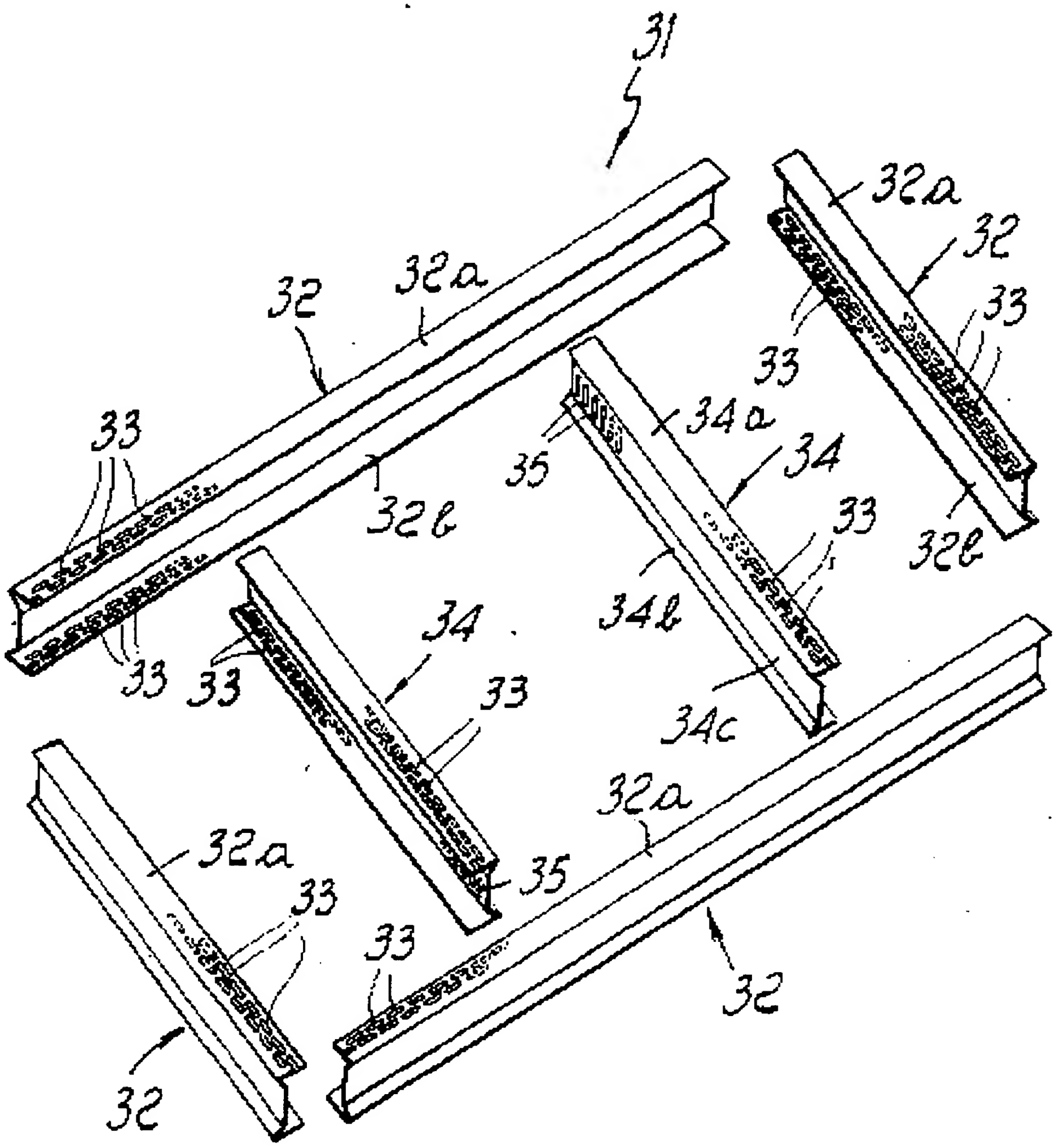

Fig. 5

THIS PAGE BLANK (USPTO)